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DATE: Draft
INITIATED BY: ANM-100 and AFS–300

ADVISORY CIRCULAR

DAMAGE TOLERANCE INSPECTIONS FOR REPAIRS

U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Flight Standards Service
Washington, D.C.

Advisory Circular

Subject: DAMAGE TOLERANCE INSPECTIONS FOR REPAIRS	**Date:** Draft **Initiated by:** ANM-100 and AFS-300	**AC No:** 120-XX

1. PURPOSE.

a. This advisory circular (AC) provides guidance material for design approval holders (DAH) and operators for developing and incorporating damage tolerance inspections and procedures. The AC supports DAH compliance with Title 14 Code of Federal Regulations (14 CFR) 25.1823, Supplemental Inspections, Holders of type certificates—Repairs," and operator compliance with 14 CFR 121.909 and 14 CFR 129.109, the Aging Airplane Safety Final Rule (AASFR), with respect to repairs. This AC is applicable to repairs to structure susceptible to fatigue cracking that could contribute to a catastrophic failure. This AC refers to that type of structure as fatigue critical structure.

b. This AC also provides guidance for new and existing repairs to airplane structure. The existing repairs include repairs made to the original, delivered, airplane structural configuration, as well as repairs to alterations and modifications. For compliance with § 121.909 and § 129.109, operators will need to demonstrate that new and existing repairs will have an evaluation and damage tolerance based inspections or other procedures implemented, if needed.

2. APPLICABILITY.

a. The guidance provided in this AC is applicable to type certificate (TC) holders, supplemental type certificate (STC) holders and operators of transport category airplanes with a type certificated passenger seating capacity of 30 or more, or a maximum payload capacity of 7,500 pounds or more. The applicability is limited to airplanes operated under parts 121 or 129 (U.S. registered airplanes).

b. Like all AC material, this AC is not, in itself, mandatory, and does not constitute a regulation. It describes an acceptable means, but not the only means, for showing compliance with the requirements for transport category airplanes. The Federal Aviation Administration (FAA) will consider other methods of showing compliance that an applicant may elect to present. While these guidelines are not mandatory, we derived them from extensive FAA and industry experience in showing compliance with the relevant regulations. On the other hand, if we become aware of circumstances that convince us that following this AC would not result in

compliance with the applicable regulations, we will not be bound by the terms of this AC. We may require additional substantiation or design changes as a basis for finding compliance.

c. This material does not change, create any additional, authorize changes in, or permit deviations from, regulatory requirements.

d. Terms in this AC, such as “shall” or “must” are used only in the sense of ensuring applicability of this particular method of compliance when the acceptable method of compliance described herein is used. While these guidelines are not mandatory, they are derived from FAA and industry experience in determining compliance with the pertinent regulations.

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CHAPTER 1. DAMAGE TOLERANCE

100. DAMAGE TOLERANCE INSPECTIONS AND PROCEDURES, DAMAGE TOLERANCE EVALUATION PROCESSES (DTE PROCESSES) AND DAMAGE TOLERANCE DATA (DT DATA).

a. The term damage tolerance inspections and procedures used in the Aging Airplane Safety Final Rule (AASFR) is synonymous with the term damage tolerance data (DT data) used in this AC. These damage tolerance inspections (DTI) for repairs supplement existing airworthiness authority –approved maintenance programs, including those contained in the instructions for continued airworthiness (ICA), scheduled maintenance programs, supplemental structural inspection document (SSID) and airworthiness limitation items (ALI) programs, service bulletins (SB), and repair assessment programs (RAP).

b. Amendment 25-45 to 14 CFR part 25 introduced the use of damage tolerance principles. This approach requires an evaluation of the structure to determine its crack growth and residual strength characteristics. The evaluation supplies the information necessary to determine a maintenance plan for continued airworthiness. For this AC, the term "damage tolerance evaluation (DTE) processes" refers to an approved process that includes analysis and/or tests and service data, that leads to a determination of a continuing airworthiness maintenance plan, including damage tolerance based inspections (i.e., DTI), or other procedures for the repair or replacement of fatigue critical structure. Consistent with the guidance provided by this AC, a DTE process could entail anything from a rigorous analysis methodology for use by a structures analyst to generic guidelines for operator use. This process will enable a survey and assessment of existing repairs to be made. In this AC, the term "DT data" means DTE documentation and DTI. Damage tolerance evaluation documentation means data that identify the evaluated fatigue critical structure, the basic assumptions applied in a DTE, and the results of a DTE. The term "DTI," as used in this AC, means inspections and other procedures developed as a result of a DTE. Other procedures may include replacement of structure. If the DTE concludes that damage tolerance based supplemental structural inspections are not necessary for a repair or alteration that affects fatigue critical structure, the DTI should contain a statement to that effect.

c. The DTE processes typically result in four items that comprise the DTI. Those items are:

- Where to inspect.
- When to start inspecting.
- How to inspect.
- How often to repeat the inspection.

d. For some airplane models, the requirements of the AASFR are beyond the scope of the original certification level. For these airplanes, development of DT data and incorporation of that data into the existing maintenance program is required. For other models, there are DT data included in various documents, for example SSIDs, repair assessment guidelines (RAGs), airworthiness limitation sections (ALSs), structural repair manuals (SRMs), and airworthiness

directives (ADs). Operators may use these DT data in part or in whole to support compliance with the repair requirements of the AASFR.

e. Sometimes, the results of the DTE process may indicate that inspections are either impractical or unreliable. In such cases, the continued airworthiness of the airplane is assured by establishing a replacement time for the repaired part.

101. OVERVIEW OF DT DATA DEVELOPMENT AND INCORPORATION.

a. Developing DT data involves accomplishing tasks typically performed by a DAH, assisted by interested operators. The product is an FAA-approved, model specific, Compliance Document that contains the output from the tasks. Incorporation of the DT data into a maintenance program involves accomplishing tasks that are typically performed by an operator. The product is a Principal Maintenance Inspector (PMI)-approved, airplane specific, Operator Implementation Plan.

b. Design approval holders and operators should develop model specific Compliance Documents with oversight provided by aviation airworthiness authorities and the Aviation Rulemaking Advisory Committee's (ARAC) Airworthiness Assurance Working Group (AAWG).

c. The following is a summary of the tasks necessary for developing DT data and incorporating it into an operator's maintenance program:

(1) Design approval holder Tasks. The following is an overview of the DAH tasks that are further developed in Chapter 2 of this AC.

(a) Identify the affected airplane model, models, or airplane serial numbers to which the DT data will apply.

(b) Identify the fatigue critical structure.

(c) Identify the certification level.

(d) Review existing DT data.

(e) Develop additional DT data.

(f) Establish implementation schedule.

(g) Prepare Compliance Document. This is a model or airplane specific document that contains the information from paragraphs (a) through (f), above. The operator will use this document to develop an implementation plan for compliance with the AASFR. In order to support operator compliance with the AASFR, the DAH should submit the Compliance Document to the FAA Oversight Office for approval and should make it available to operators by December 18, 2009.

(2) Operator Tasks. The following is an overview of the operator tasks that are further developed in Chapter 3 of this AC.

(a) Review the applicable Compliance Documents.

(b) Develop an Operator Implementation Plan. This is specific to the identified airplane or group of airplanes in the implementation plan and contains information from paragraph 101(1)(g) of this AC.

(c) Incorporate the DT data for new and existing repairs into the operator's maintenance program.

(d) Submit the implementation plan to the PMI for approval.

102. thru 199. Reserved.

CHAPTER 2. DESIGN APPROVAL HOLDERS TASKS

200. GENERAL INFORMATION ABOUT THIS CHAPTER. This chapter provides guidance to DAHs for developing data to support compliance with § 25.1823 and operator compliance with §121.909 and § 129.109, with respect to repairs. This includes the development of damage tolerance procedures, DTE processes, and DT data.

201. DEVELOPMENT OF COMPLIANCE DOCUMENTS.

a. Design approval holders supporting the operation of airplanes under parts 121 and 129 should use the following guidance material to develop data necessary to facilitate operator compliance. Airplanes certified to Amendment 25-54, or later, may not need to develop additional DT data. While data may not need to be developed, an operator will still need to demonstrate to its PMI how its existing maintenance program meets the intent of the AASFR, relative to new and existing repairs.

b. To facilitate compliance with the AASFR with respect to repairs, compliance documentation should be created that encompasses all fatigue critical structure, including repairs, alterations, and modifications (RAM), as necessary. The Compliance Document will be applicable to a specific airplane model or airplane serial number. The documentation should provide the data necessary for developing an Operator Implementation Plan with respect to a given airplane. The Compliance Document should also include implementation schedule information, as well as specific guidance on which repairs will require evaluation. This AC contains processes for both existing and future repairs. Existing repairs will be brought into the program using the implementation plan and airplane surveys after December 20, 2010. (See Appendix 6 of this AC). New repairs, installed after December 20, 2010, will be required to have DT data provided within the guidelines contained in Appendix 5 of this AC.

c. Where specific DT data need to be developed to support compliance with the AASFR, it is recommended that the model-specific Compliance Document be produced as a joint effort between the DAH, operators, and airworthiness authorities. In previous aging airplane programs, ARAC's AAWG formed airplane model specific Structures Task Groups (STGs) to develop programs for those models. Where necessary, an STG for this activity should be formed and tasked to develop the model-specific Compliance Document.

d. Figure 1, below, shows the process that may be used to produce a Compliance Document that supports compliance with the AASFR for repairs to fatigue critical structure. The paragraphs referenced in Figure 1 are in Chapter 2 of this AC.

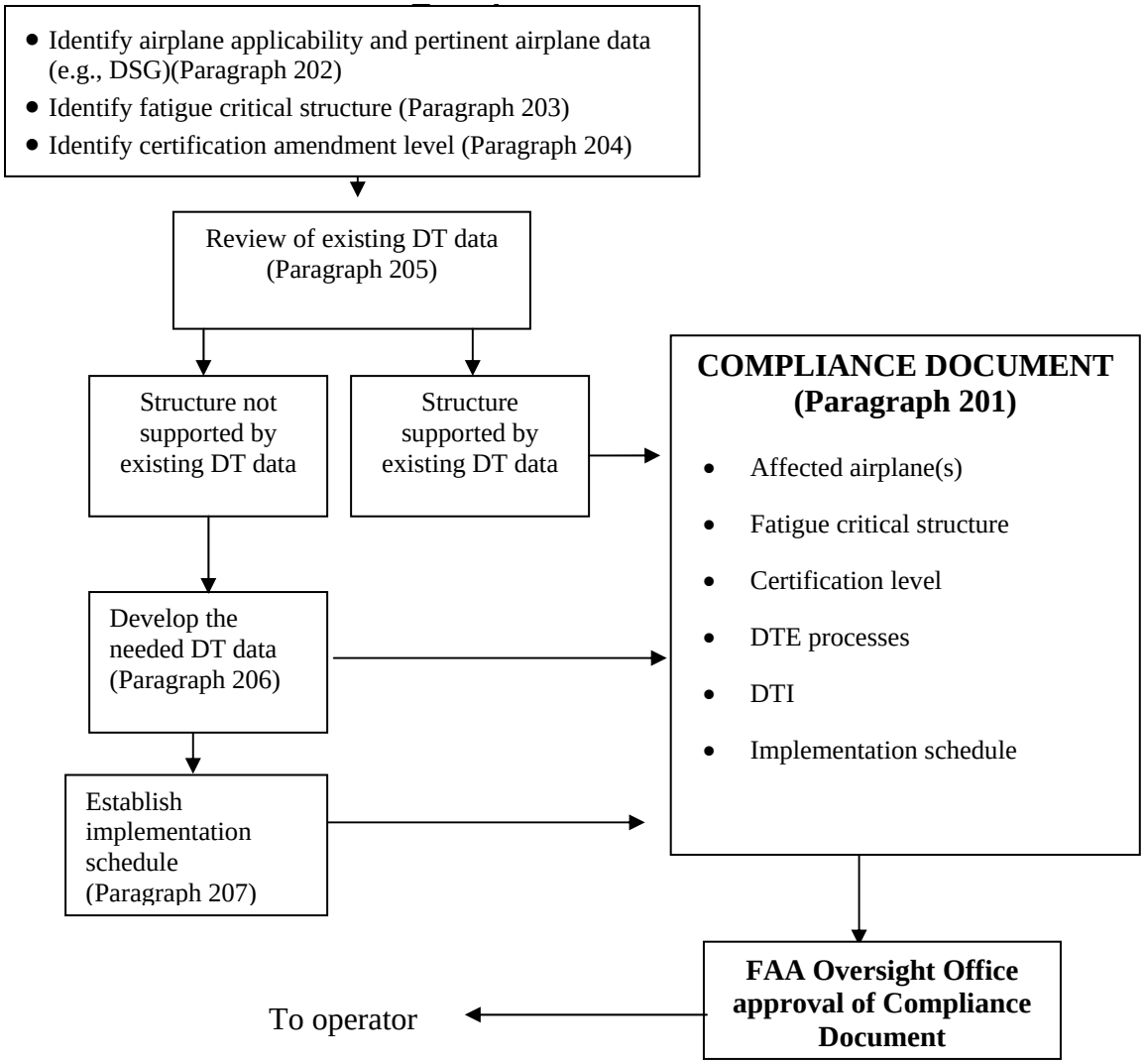

Figure 1. Development of a Compliance Document.

202. IDENTIFICATION OF AFFECTED AIRPLANES. The airplane model and model variations or serial numbers, including gross weights, should be identified in the Compliance Document for the applicable airplane models. For each model of airplane, the DAH will identify the DT data needed to support compliance with the AASFR. Some models may not require additional data.

203. IDENTIFICATION OF FATIGUE CRITICAL STRUCTURE.

a. Paragraph (c) of § 25.1823 requires TC holders to identify and make available a list of structure that is susceptible to fatigue cracking that could contribute to a catastrophic failure. This structure is referred to as "fatigue critical structure." Guidance for identifying this structure is in AC 25.571-1C, "Damage Tolerance and Fatigue Evaluation of Structure," dated April 29,

1998, or latest version. When fatigue critical structure is repaired it requires DTE to comply with the AASFR. This includes repairs to alterations and modifications of fatigue critical structure. When structure that is not defined as fatigue critical is repaired, DTE is not required.

b. When identifying the fatigue critical structure, it is not sufficient to consider only that structure contained in the SSID or ALS. Some SSIDs or ALSs might only include supplemental inspections of critical elements of the fatigue critical structure, as determined by the damage tolerance analysis. Other areas of structure may require supplemental inspections if repaired.

c. The STC holders should obtain the description of fatigue critical baseline structure from the type certificate holder. If the alteration affects this fatigue critical structure, any repairs to the alteration must have a Damage Tolerance Assessment (DTA) performed. This DTA must address any fatigue critical structure of the alteration and of the baseline structure that is affected by the repair. This information should be incorporated into a Compliance Document that is unique to the alteration

d. For compliance with § 25.1823(c), TC holders must develop the list of fatigue critical baseline structure, and submit it to the FAA Oversight Office for review and approval no later than 90 days after the effective date of the rule. Upon approval, the TC holders must make the list available to persons required to comply with § 25.1827 (STC holders) and §§ 121.909 and 129.109 of the AASFR (operators). This list should also be included in the compliance document.

204. CERTIFICATION AMENDMENT LEVEL. In order to understand what data is required for compliance with the AASFR for repairs, the DAH should identify the amendment level of the original certification relative to § 25.571. The amendment level is useful in identifying what DT data may be applicable and what standard should be used for developing data. The two airplane groups that are relevant to the AASFR are:

a. Group A - Airplanes certified before § 25.571, Amendment 25-45. These airplanes were not evaluated for damage tolerance as part of the original type certification. Therefore, the requirements of the AASFR are beyond the scope of the original certification amendment level. Repairs to fatigue critical structure will need DT data developed, unless previously accomplished.

b. Group B - Airplanes certified to § 25.571, Amendment 25-45, or later. Repairs to these airplanes will need to meet the certification level. Although these airplanes were evaluated for damage tolerance, they may not have repair data that includes DT data. In this situation, the DAH and operators may need to identify and perform a DTE of these repairs and develop DTI or other procedures.

205. REVIEW OF EXISTING DT DATA.

a. Introduction.

(1) Based on the certification amendment level and existing rules, the DAH-developed documents that may provide DT data to support compliance with the AASFR for repairs may include:

(a) Repair Assessment Guidelines (RAGs).

(b) Structural Repair Manuals (SRMs).

(c) Individual repairs.
1 Areas covered by ALS, SSID/P and RAP.
2 Other individual repairs.

(d) Service Bulletins (SBs) that provide
1 Inspections for RAMs,
2 Significant modification, or
3 Repair service bulletins

(e) Airworthiness Directives (ADs) that mandate
1 Modifications or repairs.
2 Inspections to STCs.

(2) Review each of the items above to determine the applicability of the data for compliance with the AASFR.

b. Identifying Existing DT Data.

(1) Identify repairs that have existing DT data that will support compliance with the AASFR. This material will form a portion of the data for the Compliance Document.

(2) The following documents may contain data that may be applicable in showing compliance with the AASFR.

(a) Repair Assessment Guidelines (RAGs). The programs developed for compliance with §§ 121.907 and 129.107 (previously designated as §§ 121.370 and 129.32) resulted in model specific RAGs. These documents provide support for compliance with the AASFR for repairs to the fuselage pressure boundary. Additionally, under certain circumstances, the RAGs may be applicable to repairs to STCs that modify the fuselage pressure boundary.

(b) Service Bulletins (SBs) and Airworthiness Directives (ADs). Review SBs and ADs that provide instructions to inspect or repair fatigue critical structure. Determine if

those instructions support compliance with the AASFR. The DAH should propose a process for reviewing these documents.

(c) Structural Repair Manuals (SRMs). The SRMs may contain some of the information required for compliance with the AASFR and other existing programs, such as the SSIP and RAP. Review SRMs to identify all repairs to fatigue critical structure and determine if those repairs have established DT data.

206. DEVELOPMENT OF ADDITIONAL DT DATA TO SUPPORT COMPLIANCE.

a. Introduction.

(1) When developing DT data, the certification level of the affected airplane determines the damage tolerance requirements. For Group A airplanes, use the requirements of § 25.571, at Amendment 25-45, as a minimum standard. For Group B airplanes, use the requirements that correspond to the original certification level as a minimum standard.

(2) Consider the following repairs and develop DT data according to the minimum standard determined in paragraph 206a(1) of this AC:

(a) Structural Repair Manual repairs.

(b) Service Bulletin repairs.

(c) Airworthiness Directive mandated repairs.

(d) Design approval holder reviewed and approved repairs that have general interest (multiple airplane approvals).

(e) Other repairs, including third-party approved repairs and repairs that deviate from published repairs that otherwise qualify as damage tolerant.

(3) For future repairs, DTE on an individual repair basis is acceptable. However, it may be more efficient to use published repair instructions such as SRMs or RAGs that contain already approved DT data. For published repair data to be acceptable, it should contain a statement that the DTE has been accomplished, and the data should include any DTI resulting from the DTE.

(4) There are at least two possible approaches for evaluating existing repairs identified during the review of an individual airplane. The first involves a damage tolerance analysis of each individual repair as it is identified. This is necessary for unique and complex non-routine repairs. Another approach is developing guidelines for assessing repairs that are not addressed by existing RAGs developed for compliance with § 121.907. The development of these additional guidelines would be complex and, therefore, would require the support of the DAH.

b. Performing DTEs and developing DTI on a case-by-case basis. When performing DTEs and developing DTI on a case-by-case basis, use the guidance included in AC 25.571-1C,

or later revision, that is consistent with the certification amendment level identified in paragraph 204 of this AC.

c. Developing additional repair assessment guidance. Updating the SRM and SBs, together with the existing RAG documents, forms the core of the information supplied to the operator for compliance with the AASFR. Develop and document a means in the Compliance Document to assist the operator in evaluating repairs using the updated published standards, and to determine if additional DAH support is necessary. This support may be in the form of individual repair DTA data requests or new repair evaluation guidelines (e.g., may cover fatigue critical structure of the wing, fuselage, empennage, etc.). The means developed should provide operators with a high degree of confidence that they can comply with the requirements of the AASFR.

In developing new evaluation guidelines, the percentage of existing repairs that could be addressed by the new repair guidance material should be weighed against the resources and time required to develop the guidance and have it approved. General guidance for developing this material can be found in AC 120-73, "Damage Tolerance Assessment of Repairs to Pressurized Fuselages," December 14, 2000. Even though that guidance is specific to the fuselage pressure boundary, it can also be used for structure that is susceptible to fatigue cracking.

(1) Damage Tolerance Inspections (DTI) include the following:

(a) A threshold for initial inspections of the structure.

(b) A repetitive inspection interval.

(c) A means of inspection.

(d) Occasionally, a life limit for replacing structure.

(e) A statement that damage tolerance based supplemental structural inspections are not necessary for a repair or alteration that affects fatigue critical structure, if the results of the DTE came to that conclusion.

(2) For repairs, the following repair category terminology that is contained in AC 120-73 is used to describe the maintenance requirements.

(a) For Category A repairs, normal maintenance procedures (inspection threshold and/or baseline zonal inspections (BZI)) are sufficient to provide the required damage tolerance coverage.

(b) For Category B repairs, paragraphs c(1)(a), c(1)(b), and c(1)(c) of this AC, are normally provided as part of the damage tolerance package.

(c) For Category C repairs, all four paragraphs c(1)(a), c(1)(b), c(1)(c), and c(1)(d) of this AC, are provided, as necessary.

d. Structural Repair Manuals (SRMs). Based on the review described in paragraph 205 of this AC, determine if the SRM needs revising to support compliance with § 25.1823(d). In determining the extent by which an SRM may need to be revised for compliance with § 25.1823(d), consider the following:

(1) Whether the existing SRM contains an adequate description of damage tolerance data for the specific model. This includes defined repair categories.

(2) Whether normal maintenance procedures (e.g., the inspection threshold and/or BZI) cover Category A repairs.

(3) Whether the SRM contains an identification of fatigue critical structure for the model specific airplane that, if repaired, will need a damage tolerance assessment.

(4) Whether SRM Chapter 51 standard repairs have a DT evaluation.

(5) Whether all SRM specific repairs for fatigue critical structure have DT data.

(6) Whether there is specific guidance on the size of repairs that would qualify as Category A repairs.

(7) Whether there is any guidance on proximity of repairs and the effect of this condition on damage tolerance characteristics.

(8) The need to address superseded repairs and how DT data for future superseded repairs will continue to be made available.

e. Service Bulletins (SBs). Based on the review performed in paragraph 205 of this AC, determine if the SBs need DT data to support compliance with the AASFR. The Compliance Document needs to identify the status of the DT data for those SBs.

207. IMPLEMENTATION SCHEDULE. The implementation schedule described in this section represents an acceptable time line to establish DT data and continued airworthiness maintenance plans for both existing and new repairs. Any deviation to the time line must be justified and presented to the FAA Oversight Office* for approval. To support the operator in developing an implementation plan for its particular fleet of airplanes, include the information contained in this section in the Compliance Document. This implementation schedule supports compliance with § 121.909 regarding the requirement to address the adverse effects repairs have on fatigue cracking and the inspection of fatigue critical structure. In principle, this implementation schedule is similar to the implementation schedule adopted for compliance with § 121.907 (previously designated as § 121.370).

a. Existing repairs that already have DT data developed and included in the maintenance program. These repairs require no further action.

b. Existing repairs that either do not have DT data or have not had ICA included in the maintenance program. Identify and evaluate all existing repairs that affect fatigue critical structure. For the purposes of compliance with the AASFR, only existing repairs that reinforce (e.g., restore strength) the fatigue critical structure need to be considered. This typically excludes maintenance actions such as blend-outs, plug rivets, trim-outs, etc. For those existing repairs that do not have DT data or other procedures implemented, establish that data according to an FAA-approved plan. Assessing existing repairs consists of the following three steps, which are defined in Appendix 6 of this AC:

- Airplane repair survey.
- Identification and disposition of repairs requiring immediate action.
- DTI development.

The timing allowance for each of these steps depends on the age of the airplane on December 18, 2009. The following program will support the DAH's development of an implementation schedule for the Compliance Document. This implementation schedule will be incorporated as part of the Operator Implementation Plan developed in Chapter 3 of this AC.

(1) Implementation Schedule for Survey and Disposition.

(a) Airplanes less than 75 percent of the Design Service Goal (DSG) on December 18, 2009. Operators would complete a survey at the first heavy maintenance check (time limit equivalent to a D-check) after 75 percent DSG, not to exceed DSG, completing steps 1 and 2 of the DTI assessment process (see Appendix 6). Within 12 months after accomplishing step 1, complete step 3 of Appendix 6 of this AC. A heavy maintenance check (D-check or equivalent airplane inspection) means an airplane maintenance visit where the major structural inspections are performed. In some cases, this may be a formal D-check or, in the case of a

* For purposes of this subpart, the "FAA Oversight Office" is the aircraft certification office or office of the Transport Airplane Directorate with oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

MSG-2 or -3 based maintenance program, the D-check equivalent may be the "C-check" multiple that contains the majority of the major structural inspections, such as a "C-4 which is sometimes called a heavy maintenance visit.

(b) Airplanes between 75 percent of the DSG and the DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps 1 and 2 of the DTI assessment process (see Appendix 6 of this AC) at or before the next heavy maintenance check (equivalent to a D-check) after December 20, 2010, not to exceed DSG or 6 years, whichever occurs later. Within 12 months after accomplishing step 1., complete step 3. of Appendix 6 of this AC.

(c) Airplanes greater than the DSG on December 18, 2009. Operators would complete a survey of these airplanes completing steps a. and b. of the DTI assessment process (see Appendix 6 of this AC) at or before the next heavy maintenance check (equivalent to a D-check), not to exceed 6 years. Operators should not defer the implementation of the program until the end of the D-check time period. Rather they should evenly distribute the surveys over the 6 year period, with the high time airplanes being surveyed first. For example, if an operator has 30 airplanes over DSG on December 18, 2009, and is operating on a 6-year D-check equivalent, the operator would inspect approximately 5 equivalent airplanes each year until all of the airplanes were inducted into the program. The highest time airplanes should be inspected first (e.g., using the above example of 30 affected airplanes, the 10 highest time airplanes should be surveyed in the first two years). Within 12 months after accomplishing step 1., complete step 3. of Appendix 6 of this AC.

NOTE: The DAH should identify the established DSG for a particular airplane type that is representative of the airplane, considering the probable variation of the number of flight hours per cycle that could exist in the fleet.

(2) Implementation of DTI.

(a) Once the DTI is known, accomplish the first inspection of the repair according to the schedule of the DTI, as follows:

1 Inspect the repair before the inspection threshold or within a time limit equivalent to a C-check from accomplishment of the assessment, whichever occurs later.

2 If the age of the repair is unknown, use the airplane age in cycles or hours.

(b) Implement repetitive inspection intervals per the instructions provided.

d. New Repairs. Unless already required by the airplane certification level or other FAA-approved program, beginning December 21, 2010, and thereafter, all new repairs to fatigue critical structure must have a DTE performed. Implement any DTI established from the DTE according to the process described in Appendix 5 of this AC. This includes blendouts, trim-outs, etc. that are beyond published DAH limits.

e. Repairs to Removable Structural Components. Fatigue critical structure may include structure on removable structural parts or assemblies that can be exchanged from one airplane to another, such as door assemblies, flight control surfaces, etc. In principle, the DT data development and implementation process also applies to repairs to fatigue critical structure on components. During their life history, however, these parts may not have had their flight times recorded on an individual component level because of removal and reinstallation on different airplanes multiple times. These actions may make it impossible to determine the age or total flight cycles or flight hours. In these situations, guidance for handling DT data development and implementation for existing and new repairs is given in Appendix 7 of this AC.

208. FAA APPROVAL OF COMPLIANCE DOCUMENT. The FAA Oversight Office responsible for an airplane type certificate or supplemental type certificate will review and approve the Compliance Document submitted by the DAH and any revision to an FAA-approved Compliance Document.

209. thru 299. Reserved.

CHAPTER 3. OPERATOR TASKS

300. GENERAL INFORMATION ABOUT THIS CHAPTER. This chapter provides guidance regarding damage tolerance inspections and procedures. Additionally, this chapter provides guidance to operators on how to revise their maintenance programs, as required by §§ 121.909 and 129.109.

301. DEVELOPMENT OF AN OPERATOR IMPLEMENTATION PLAN

a. For repairs to fatigue critical structure, the AASFR requires affected air carrier certificate holders to incorporate FAA-approved DTE Processes and DTI into their maintenance programs by December 20, 2010. This includes both existing and new repairs, and repairs, alterations, and modifications of fatigue critical structure. The means of incorporating DT data into a certificate holder's FAA-approved maintenance program is subject to approval by the certificate holder's PMI or other airworthiness inspector. The Compliance Document developed using Chapter 2 of this AC provides the basic guidance, including identification of the fatigue critical structure and DT data and implementation schedule information.

b. Operators should incorporate the information that includes the Compliance Document processes, data, and requirements into each operator's existing maintenance program in a way that best fits their existing maintenance programs. The PMI or airworthiness inspector will then approve the Operator's Implementation Plan.

302. REVIEW OF APPLICABLE COMPLIANCE DOCUMENTS.

a. For each affected airplane in an operator's fleet, the operator should review the applicable FAA-approved Compliance Document (discussed in Chapter 2 of this AC). The Compliance Document will identify all fatigue critical structure, the DT data for the fatigue critical structure, and the implementation schedule information for incorporating DT data into the operator's maintenance program.

b. In addition, the operator should review any additional FAA-approved Compliance Documents associated with a given model airplane for repairs to RAMs and third-party approved repairs. These may be applicable to the entire model fleet or to individual airplanes within a given fleet type. These Compliance Documents will also identify fatigue critical structure for that fleet type, the DT data for the fatigue critical structure, and the implementation schedule information for incorporating DT data into the operator's maintenance program.

c. Figure 2, below, shows how an operator can use the Compliance Document to develop an Operator Implementation Plan for its fleet. While the Operator Implementation Plan is airplane specific, it may incorporate processes and procedures that are applicable to other airplanes operated by a certificate holder. This includes administrative procedures for applying elements common to each implementation plan. Consider the guidance in the following flow-chart when developing an Operator Implementation Plan.

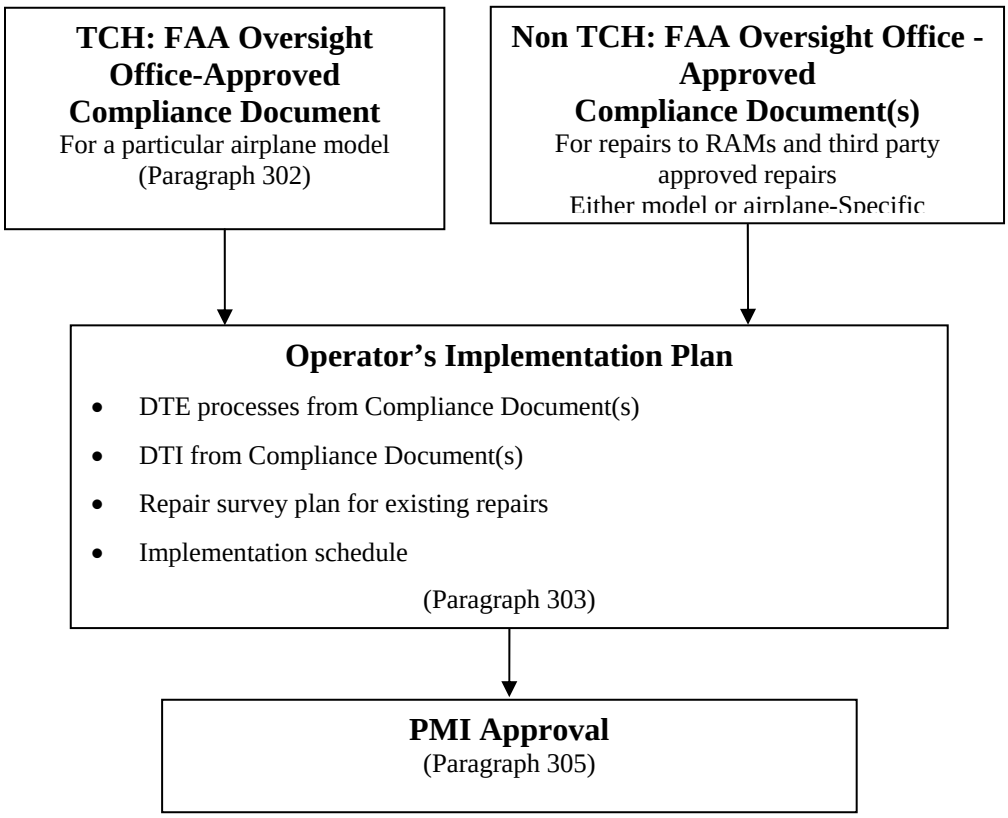

Figure 2. Operator Implementation Plan Approval Process

303. INCORPORATION OF DT DATA FOR NEW AND EXISTING REPAIRS. After the reviews of the applicable Compliance Document are complete, the operator should include the following into an Operator Implementation Plan:

a. A process to ensure that all new repairs to fatigue critical structure will be evaluated for damage tolerance and have DTI or other procedures implemented.

b. A process to ensure that all existing repairs to fatigue critical structure are evaluated for damage tolerance and have DTI or other procedures implemented. This process includes:

(1) A review of operator processes to determine if DT data for repairs affecting fatigue critical structure have been developed and incorporated into the operator's maintenance program throughout the life of the airplane. If an operator is able to demonstrate to it's PMI that these processes ensure that DT data is developed for all repairs affecting fatigue critical structure, then no further action is required for existing repairs.

(2) The incorporation of processes that an operator can use to survey existing repairs that affect fatigue critical structure and determine DTI for those repairs. These processes are derived from the Compliance Document. The processes should be incorporated into the operator's maintenance program within the time frame given in the Compliance Document.

c. An implementation schedule, which follows the guidance provided in the Compliance Documents.

d. A repair survey plan. Utilizing the survey parameters from Chapter 2 of this AC, the operator devises a plan to survey its airplanes for repairs that may need DT data developed. This survey plan may be divided into three groups of airplanes, those that are below 75 percent DSG, those that are between 75 percent DSG and DSG, and those above DSG, on December 18, 2009. Examples of typical calculations to determine when an airplane needs to be surveyed are contained in Appendix 8 of this AC. In the following three repair survey scheduling processes, the DSG is in cycles.

(1) For an airplane that has not reached 75 percent of the DSG on December 18, 2009: The operator should perform the survey at the first heavy maintenance check (equivalent to a D-check) after 75 percent of the DSG is reached, not to exceed the DSG. A heavy maintenance check (D-check or equivalent airplane inspection), means an airplane maintenance visit where all the major structural inspections are performed. In some cases, this may be a formal D-check or, in the case of a MSG-2 or -3 based maintenance program, the D-check equivalent may be the "C-check" multiple that contains the majority of the major structural inspections, such as a "C-4 which is sometimes called a heavy maintenance visit.

(2) For an airplane that has reached 75 percent of the DSG, but is less than or equal to the DSG on December 18, 2009: The operator should perform the survey at the next heavy maintenance check, not to exceed the DSG or 6 years, whichever occurs later.

(3) For an airplane that has exceeded the DSG on December 18, 2009: The survey should be accomplished at or before the next heavy maintenance check, not to exceed 6 years. Operators should not defer the implementation of the program until the end of the D-check time period. Rather they should evenly distribute the surveys over the 6 year period, with the high time airplanes being surveyed first. For example, if an operator has 30 airplanes over DSG on December 18, 2009, and is operating on a 6-year D-check equivalent, the operator would inspect approximately 5 equivalent airplanes each year until all of the airplanes were inducted into the program. The highest time airplanes should be inspected first (e.g., using the above example of 30 affected airplanes, the 10 highest time airplanes should be surveyed in the first two years.

e. Implementation Techniques. Use one of the two techniques below to implement DTI for repairs:

(1) The first technique involves incorporating DT data directly into the operator's maintenance program.

(2) The second technique involves an alternative to tracking individual repairs. In this approach, incorporate the DTI as part of an operator's routine maintenance program. This approach is well suited for operators of large fleets and entails evaluating repairs at predetermined, planned, maintenance visits as part of the maintenance program. This technique requires the operator to choose an inspection method and interval using an FAA-approved DTE.

Use the regular FAA-approved maintenance or inspection program for repairs where the inspection requirements utilize the chosen inspection method and interval. Repairs added between the predetermined maintenance visits, including Category B and C repairs installed at remote locations, should have a threshold greater than the predetermined maintenance visit. The repairs may also be individually tracked to account for unique inspection methods and interval requirements. This ensures the airworthiness of the structure until the next predetermined maintenance visit, when the repair is evaluated as part of the repair maintenance program.

Category B or C repairs, where inspection requirements are not fulfilled by the chosen inspection method and interval, need additional attention. These repairs require either an upgrade to allow utilization of the chosen inspection method and interval, or individual tracking to account for its unique inspection method and interval requirements.

NOTE: DTI thresholds and repetitive intervals for individual repairs cannot be exceeded without FAA approval.

304. EXISTING OPERATOR RESPONSIBILITIES.

a. Reporting Requirements. There are no added reporting requirements associated with the AASFR. However, the FAA encourages operators to report significant findings to the TC holders to ensure that prompt fleet action is taken. Existing reporting requirements under § 121.703 still apply.

b. Record-keeping Requirements. Once the FAA has approved the Operator Implementation Plan, include the list of the required inspections and their status in the records review requirements of §§ 121.368 and 129.33. Existing record-keeping requirements are still applicable.

c. Transfer of Airplanes after December 20, 2010. After December 20, 2010, before adding an airplane to an air carrier's operations specifications or operator's fleet, the following should apply:

(1) For airplanes previously operated under an FAA-approved maintenance program: The new operator may use either the previously PMI-approved Operator Implementation Plan (if approved by their PMI) or its own PMI-approved implementation plan.

(2) For airplanes not previously operated under an FAA-approved maintenance program: The operator develops and implements an Operator Implementation Plan. If the airplane's DSG and compliance times have been exceeded, perform any outstanding DTI according to a schedule approved by the PMI.

d. Operation of Leased Foreign-Owned Airplanes. Acquisition of a leased foreign-owned airplane for use in operations under parts 121 or 129 will require the certificate holder to develop and implement an Operator Implementation Plan.

e. Maintenance Program Changes. When revising a maintenance program, and the continued airworthiness of repairs to fatigue critical structure is dependent on that program, the operator must evaluate the impact of the change on continued airworthiness. For example, maintenance program inspection intervals such as those specified for BZI, are adequate to ensure the continued airworthiness of Category A repairs (see AC 120-73, Stage 2: Repair Classification). Therefore, if the maintenance program is revised in a manner that changes these inspection intervals, the operator must assess whether the new interval is adequate for classifying the repairs as Category A.

305. FAA PMI APPROVAL OF OPERATOR IMPLEMENTATION PLAN. The certificate holder's PMI, or other airworthiness inspector, is responsible for approving the means for incorporating the DT data for repairs into a certificate holder's FAA-approved maintenance program. An operation specification revision will show approval of the plan.

306. thru 399. Reserved.

CHAPTER 4. ADMINISTRATIVE REQUIREMENTS

400. ADVISORY CIRCULAR AVAILABILITY

HOW DO I GET A COPY OF THE PUBLICATIONS REFERRED TO IN THIS AC?

a. The CFR and those ACs for which a fee is charged may be obtained from the Superintendent of Documents at the following address. A listing of the CFR and current prices is located in AC 00–44, "Status of Federal Aviation Regulations," and a listing of all ACs is found in AC 00–2, "Advisory Circular Checklist."

Superintendent of Documents
P.O. Box 371954
Pittsburgh, PA 15250–7954

b. To be placed on our mailing list for free ACs contact:

U.S. Department of Transportation
Subsequent Distribution Office
M-30
Ardmore East Business Center
3341Q 75th Avenue
Landover, MD 20785

c. You may view and print the CFR and Aircraft Certification Service and Flight Standards Service ACs on the FAA Web page at http://www.airweb.faa.gov/rgl.

401. WHO DO I SUBMIT COMMENTS TO ABOUT THIS AC?

Submit direct comments regarding this AC to:

U.S. Department of Transportation
Federal Aviation Administration
Aircraft Maintenance Division, AFS-300
800 Independence Avenue SW.
Washington, DC 20591

402. thru 499. Reserved.

APPENDIX 1. REGULATORY AND GUIDANCE MATERIAL RELATED TO THIS AC

The following related documents are provided for information purposes and are not necessarily directly referenced in this AC. An electronic copy of the current revision levels of the following rules, ACs, and FAA Policy Statement that are noted by an (*) can be downloaded from the Internet at http://www.airweb.faa.gov/rgl.

1. Title 14 of the Code of Federal Regulations (14 CFR):

a. Part 21, §21.101, Designation of applicable regulations.*
b. Part 25, § 25.571, Damage-tolerance and fatigue evaluation. *
c. Part 25, § 25.1529, Instructions for continued airworthiness.*
d. Proposed Part 25, § 25.1823, Supplemental Inspections, Holders of type certificates—Repairs*
e. FAA Final Rule – "Fuel Tank Safety Compliance Extension and Aging Airplane Program" (69 FR 45936, July 30, 2004).*
f. Part 43, § 43.13, Performance rules (general). *
g. Part 43, §43.16, Airworthiness Limitations.*
h. Part 91, § 91.403, General. *
i. Part 121, § 121.368, Aging airplane inspections and records reviews.*
j. Part 121, § 121.907 (previously designated as § 121.370), Special maintenance program requirements.*
k. Part 121, § 121.909, Supplemental inspections. *
l. Part 129, § 129.109, Supplemental inspections for U.S.-registered aircraft.
m. Part 129, § 129.107 (previously designated as § 129.32), Special maintenance program requirements.
n. Part 129, § 129.33, Aging airplane inspections and records reviews for U.S.-registered multiengine aircraft.*

2. Advisory Circulars (AC):

a. AC 21.101-1, Change Product Rule*
b. AC 25.571-1C, Damage Tolerance and Fatigue Evaluation of Structure*
c. AC 25.1529-1, Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes*
d. Proposed AC 25.XX, Subpart I, Continued Airworthiness and Safety Improvements*
e. AC 91-56A, Continuing Structural Integrity Program for Large Transport Category Airplanes *
f. AC 120-73, Damage Tolerance Assessment of Repairs to Pressurized Fuselages*

3. FAA Policy Statement: PS-ANM110-7-12-2005, Policy Statement, Safety – A Shared responsibility – New Direction for Addressing Airworthiness Issues for Transport Airplanes," issued July 6, 2005, effective July12, 2005.*

4. FAA Orders:

a. Proposed Order 8300.10 Rev. XX, Airworthiness Inspectors Handbook

b. Proposed Order 8110.XX, Continued Airworthiness and Safety Improvements, Responsibilities, Requirements, and Contents for Design Approval Holders

5. Other Documents referred to in this AC:

a. A Final Report of the AAWG – Continued Airworthiness of Structural Repairs**

b. A Report of the AAWG – Recommendations for Regulatory Action to Prevent Widespread Fatigue Damage in the Commercial Airplane Fleet**

c. A Report of the AAWG - Recommendations For Regulatory Action To Enhance Continued Airworthiness Of Supplemental Type Certificates**

d. Air Transport Association (ATA) Report 51-93-01***

e. ATA Response to FAA Docket 1999-5401, dated May 5, 2003***

f. FAA-Approved, Model Specific, Repair Assessment Guidelines ****

g. FAA-Approved, Model Specific, Supplemental Inspection Documents****

** An electronic copy of the AAWG reports can be downloaded from the Internet at http://www.faa.gov.

*** Please contact the ATA. Air Transport Association of America, Inc., 1301Pennsylvania Avenue., NW, Suite 1100, Washington, DC 20004-1707; telephone (202) 626-4000.

**** Various manufacturers publish these documents. Please contact the applicable manufacturer regarding the general availability of the documents. The addresses are provided below.

- Airbus, 1 Rond-Point Maurice Bellonte, 31700 Blagnac Cedex, France
- The Boeing Company, P.O. Box 3707, Seattle, Washington 98124-2207
- Bombardier Aerospace, Bombardier Inc., 400 Cote Vertu West, Donval, Quebec, H4S 1Y9

- British Aerospace, British Aerospace Regional Aircraft American Support, 13850 Mclearen Road, Herndon, Virginia 20171

- Fokker Services B.V., P.O. Box 231, 2150 AE Nieuw-Vennep, the Netherlands

- Lockheed Martin Corporation/Lockheed Martin Aeronautics Company, Airworthiness Office, Dept. 6A0M, Zone 0252, Column P-58, 86 S. Cobb Drive, Marietta, Georgia 30063

APPENDIX 2. DEFINITIONS

a. Airplane structural configuration is the approved type certificate design, including the original; any model variations or derivatives; and alterations or replacements mandated by AD.

b. Airworthiness Limitations Section (ALS) is a collection of mandatory maintenance actions required for airplane structure and fuel tank system. For structural maintenance actions, the ALS includes structural replacement times, structural inspection intervals, and related structural inspection procedures.

c. Alteration or modification is an FAA-approved design change that is made to an airplane. Within the context of this AC, the two terms are synonymous.

d. Amended Type Certificate (ATC) is a process where the type certificate holder may modify the airplane and have the modification approved by amending the original type certificate under § 21.177.

e. Damage Tolerance Evaluation (DTE) is a process that leads to a determination of continuing airworthiness inspections and other procedures for a repair using damage tolerance procedures as defined in AC 25.571-1, 1A, 1B, or 1C.

f. DTE Documentation is data that identifies the evaluated fatigue critical structure, the basic assumptions applied in a DTE, and the results of a DTE.

g. Damage Tolerance Inspections (DTI) are inspections and other procedures developed as a result of a DTE. These include the location of the airplane structure to be inspected, the inspection method, the threshold and interval associated with those inspections, and corrective maintenance actions.

h. Design Approval Holder (DAH) is a person that holds a type design approval for an airplane or any FAA-approved data necessary to repair, alter, or modify airplane structure.

i. Design Service Goal (DSG) is the period of time (in flight cycles or flight hours) established at design and/or certification during which the principal structure will be reasonably free from significant cracking.

j. Damage Tolerance data is DTE documentation and DTI needed by an operator to address repairs as required by the AASFR.

k. Federal Aviation Administration Oversight Office is the Aircraft Certification Office or office of the Transport Airplane Directorate having oversight responsibility for the relevant type certificate or supplemental type certificate, as determined by the Administrator.

l. Instructions for Continued Airworthiness (ICA) are maintenance actions defined by the TC or STC holder in accordance with 14 CFR 25.1529 and delivered with the airplane in

accordance with § 21.509. ICA are documented information that include the applicable methods, inspections, processes, procedures and airworthiness limitations.

m. Repair is the restoration of an item to a serviceable condition in conformity with an approved standard.

n. Repair Assessment Guidelines (RAG) is a document that provides a means to establish a damage tolerance based inspection program for repairs to detect damage that may develop in a repaired area before that damage degrades the load carrying capability of a structure below the levels required by the applicable airworthiness standards.

o. Repair Assessment Program (RAP) is a program to incorporate damage tolerance based inspections for repairs to the fuselage pressure boundary structure into the operator's FAA-approved maintenance and/or inspection program as required by § 121.907 (previously designated as § 121.370.)

p. Structures Task Group (STG) is a model specific group that consists of DAHs and operators responsible for the development of aging airplane model specific programs. It also includes regulatory authorities who approve and monitor those programs.

q. Supplemental Structural Inspection Program (SSIP) is a damage tolerance based inspection program. Structural Inspection Programs only address the structure identified by the type certificate holder using the guidance contained in AC 91-56.

r. Type Design consists of drawings and specifications; information on dimensions, materials, and processes; airworthiness limitations; and any other data necessary to describe the design of the product (see § 21.31).

APPENDIX 3. ACRONYMS USED IN THIS AC

AASA	Aging Airplane Safety Act
AASFR	Aging Airplane Safety Final Rule
AASIFR	Aging Airplane Safety Interim Final Rule
AAWG	Airworthiness Assurance Working Group
AC	Advisory Circular
ACO	Aircraft Certification Office
AD	Airworthiness Directive
ALI	Airworthiness Limitation Items
ALS	Airworthiness Limitations Section
ARAC	Aviation Rulemaking Advisory Committee
ATC	Amended Type Certificate
BZI	Baseline Zonal Inspection
DAH	Design Approval Holder
DSG	Design Service Goal
DT Data	Damage Tolerance Data
DTA	Damage Tolerance Assessment
DTE	Damage Tolerance Evaluation
DTI	Damage Tolerance Inspections
FAA	Federal Aviation Administration
ICA	Instructions for Continued Airworthiness
PMI	Principal Maintenance Inspector
PSE	Principal Structural Element
RAG	Repair Assessment Guideline
RAM	Repairs, Alterations, and Modifications
RAP	Repair Assessment Program
SB	Service Bulletins
SRM	Structural Repair Manual
SSID	Supplemental Structural Inspection Document
SSIP	Supplemental Structural Inspection Program
STC	Supplemental Type Certificate
STG	Structures Task Group

APPENDIX 4. BACKGROUND

a. Structural fatigue is recognized as a significant threat to the continued airworthiness of airplanes. This is because even small fatigue cracks can significantly reduce the strength of the structure. Airplanes are subject to structural fatigue throughout their operational lives. Due to concerns over fatigue cracking, the airworthiness standards for certification of new transport category airplanes have always addressed fatigue with the intent of avoiding catastrophic failures. However, these requirements have not remained unchanged. They have evolved as the relevant knowledge base has increased. This knowledge includes service experience, specific incidents and accidents, and technological advances in designing, analyzing, testing, manufacturing, and inspecting airplanes.

b. One of the first significant changes in the standards occurred in March 1956 with revision of the Fatigue Evaluation requirements contained in CAR 4b.270. This revision added "Fail-safe strength" as an option to the "Fatigue strength" approach for addressing fatigue. Motivation for this change was the realization that precluding fatigue cracking from occurring might not always be possible and, therefore, as an option, the structure may be designed to survive cracking. The fatigue strength approach tries to achieve a design where fatigue cracking is not probable within the operational life of the airplane. The fail-safe approach assumed that cracking could occur, while maintaining a specified minimum strength after a "fatigue failure or obvious partial failure" had occurred. The efficacy of the fail-safe approach was not only dependent on the structure keeping the specified minimum strength with the fatigue damage present, but also on finding the damage during normal maintenance. As applied, the fail-safe approach emphasis is on redundancy as opposed to fatigue performance, and inspectability is assumed and not quantified. The fail-safe option was the predominate approach chosen for most large transport category airplanes certified in the 1960s and 1970s.

c. Another significant change in the airworthiness standards for fatigue occurred in October 1978 with Amendment 25-45, with the revision of § 25.571 and the deletion of § 25.573. This change involved removing the fail-safe option entirely and establishing a new requirement to develop damage tolerance based inspections wherever practical. The fatigue strength approach, as a default option, is used only if the damage tolerance approach is impractical. The motivation for the 1978 change is a recognition, based on mounting evidence, that the fail-safe approach applied up to that point was not reliable and would not achieve the desired level of safety. Specific areas of concern with the fail-safe approach included the loss of fail-safety with age. This is because of the increased probability of cracking in the structure adjacent to the fatigue failure, or obvious partial failure, and the lack of directed inspections and quantification of residual life with the assumed damage present. It was agreed at the time that more emphasis is needed on where and how fatigue cracking could occur in the structure, and on quantifying crack growth and residual strength characteristics. This includes damage tolerance characteristics and development of effective inspection protocols, such as where, when, how, and how often to inspect. The 1978 changes achieved this for certification of new transport category airplanes.

d. The same events and reasoning that drove the changes to airworthiness standards for new airplanes also influenced the strategy adopted to ensure the continued airworthiness of the

existing fleet. There was increasing concern about existing older airplanes certified according to the fail-safe requirements of CAR 4b.270. Eleven large transport models were specifically identified as needing the most attention. FAA determined a need to develop damage tolerance based inspection programs. These inspections supplement existing maintenance inspections, so these programs were referred to as SSIPs. The inspection requirements were documented in supplemental inspection documents (SIDs). It was also agreed that SIDs would be developed by the OEMs on a voluntary basis and then mandated by AD. The Civil Aviation Authority (CAA) for the United Kingdom published guidance for developing the SSIPs in Airworthiness Notice No. 89, "Continuing Structural Integrity of Transport Aeroplanes," dated August 23, 1978, and by the FAA published guidance for developing the SSIPs in AC No. 91-56, "Supplemental Structural Inspection Program for Large Transport Category Airplanes," dated May 6, 1981. Subsequently, SSIPs were developed and mandated by AD for the eleven aging model airplanes. Little or no consideration was given to RAMs. However, later revisions to two of the ADs addressed some RAMs.

e. In April 1988 one of the eleven aging model airplanes, suffered major structural damage to its pressurized fuselage structure because of undetected fatigue cracking of the baseline primary structure. That airplane had a SSIP that was mandated by AD. The accident was attributed, in part, to the aging of the airplane involved, and precipitated actions that culminated in regulations aimed at avoiding catastrophic failures from fatigue in existing and future airplanes.

f. In response to the April 1988 accident the FAA sponsored a conference on aging airplanes and established a task force representing the interests of the airplane operators, airplane manufacturers, regulatory authorities, and other aviation representatives. In addition, other recommendations from this task force specifically recommended consideration of damage tolerance for repairs. In direct response to these recommendations, the FAA adopted changes to parts 91, 121, 125 and 129 in April 2000. These required operators to incorporate damage tolerance based inspections for existing and future repairs to the fuselage pressure boundary for the eleven aging model airplanes previously identified. This did not address other model airplanes or repairs to other structure.

g. The April 1988 accident also precipitated Congressional legislation. In October 1991, Congress enacted Title IV of Public Law 102-143, the "Aging Airplane Safety Act of 1991" (AASA). Two key elements of the AASA are as follows:

(1) Required "the Administrator to make such inspections and conduct such reviews of maintenance and other records of each airplane used by an air carrier to provide air transportation as may be necessary to determine that such is in a safe condition and is properly maintained for operation in air transportation."

(2) Specified that an air carrier must be able to demonstrate, as part of the inspection, "that maintenance of the airplane's structure, skin, and other age sensitive parts and components have been adequate and timely enough to ensure the highest level of safety."

h. Although the AASA did not define specifics of what had to be done, the one clear intent was to avoid catastrophic failures because of fatigue throughout the operational life of each affected airplane. Consistent with this, and the damage tolerance requirements adopted in 1978 for new transport category airplanes, FAA initiated rulemaking that would require broader implementation of damage tolerance based structural inspection programs. This would apply to almost all multi-engine airplanes used in scheduled passenger service. Additionally, the intent was to address all structure where fatigue cracking could result in catastrophic failure.

i. In response to the AASA, FAA rulemaking efforts eventually resulted in the issuance of the Aging Airplane Safety Interim Final Rule (AASIFR) on December 6, 2002. This rule required implementation of damage tolerance based inspection programs for all airplanes operated under part 121 and 129 operations. The AASIFR was also applicable to all multi-engine airplanes engaged in part 129 or 135 operations that were initially certificated with 10 or more passenger seats by December 8, 2007. Airplanes operated between any point within the State of Alaska and any other point within the State of Alaska were exempt from that rule.

j. The AASIFR was subsequently amended and finalized on February 2, 2005, as the Aging Airplane Safety Final Rule (AASFR). The revised rule requires implementation of damage tolerance based inspection programs by December 20, 2010. This applies to airplanes engaged in part 121 or 129 operations with type certificated passenger seating capacity of 30 or more or a payload capacity of 7,500 pounds or more. Airplanes operated within Alaska remain exempt. Although the scope has been reduced, the AASFR still affects the majority of airplanes engaged in scheduled passenger service. Relative to damage tolerance based inspection programs, the AASFR raises the level of safety on the existing fleet of affected airplanes to the same level required for current transport category airplane type design approvals.

APPENDIX 5. APPROVAL PROCESS FOR NEW REPAIRS

In the past, AC 25.1529-1, "Instructions for Continued Airworthiness of Structural Repairs on Transport Airplanes," August 1, 1991, allowed a two-stage approach in approving repairs to principal structural elements. The two-stage approach consisted of:

- Type design strength requirements of § 25.305 before return to service
- Damage tolerance evaluation performed and DT data developed to demonstrate compliance with § 25.571 within 12 months of return to service.

The guidance material in AC 25.1529-1 is now embodied in this AC, and is modified to allow a three-stage approach now commonly used in the industry.

The DT data includes inspection requirements (i.e., inspection threshold, inspection method, and inspection repetitive interval) or other procedures (e.g., replacement/modification time) if inspections are shown to be impractical. The required data may be submitted all at once, prior to the airplane return to service, or it may be submitted in stages. The following three-stage approval process is available, which involves incremental approval of engineering data to allow an airplane to return to service before all the engineering data previously described is submitted. The three stages are described as follows:

a. The first stage is approval of the static strength data and the schedule for submittal of the DT data. This approval is required prior to returning an airplane to service. The submittal of the DT data should generally occur prior to 12 months after the airplane was returned to service.

b. The second stage is approval of the DT data. The DT data should be submitted in accordance with the schedule approved in the first stage. The DT data might only contain the threshold where inspections are required to begin as long as the operator can demonstrate that a process is in place to acquire the required inspection method and repetitive intervals before the threshold is reached. In this case, the submittal and approval of the remaining DT data may be deferred to the third stage.

c. The third stage is approval of the DT data not submitted and approved in the second stage. This would typically involve the inspection method and the repetitive intervals. This data would need to be submitted and approved prior to the inspection threshold being reached. Operation beyond the threshold would not be allowed unless the data is submitted to and approved by the FAA.

APPENDIX 6. ASSESSMENT OF EXISTING REPAIRS

A DTI assessment process consists of the following steps:

1. Airplane Repair Survey. A survey will be used to identify existing repairs and repair configurations on fatigue critical structure and provide a means to categorize those repairs. The survey would apply to all affected airplanes in an operator's fleet, as defined in the Operator Implementation Plan, using the process contained in the Compliance Document. The procedure to identify repairs that require DTE should be developed and documented in the Compliance Document using § 25.571 and AC 25.571-1C (dependant on airplane certification level), together with additional guidance specific to repairs, such as:

a. Size of the repair

b. Repair configuration

(1) SRM standards

(2) Other

c. Proximity to other repairs

d. Potential affect on fatigue critical baseline structure

(1) Inspectability (access and method)

(2) Load distribution

2. Identification and Disposition of Repairs Requiring Immediate Action. Certain repairs may not meet minimum requirements because of cracking, corrosion, dents, or inadequate design. Use the guidance provided in the Compliance Document to identify these repairs and take appropriate corrective action. In some cases, modifications may need to be made before further flight. If similar repairs may have been installed on other airplanes consider performing a fleet campaign.

> **NOTE**: **Additional FAA Certificate Maintenance Office (CMO) coordination and approval or regulatory action may be required in these cases.**

3. Damage Tolerance Inspection Development. This includes the development of the appropriate maintenance plan for the repair under consideration. During this step determine the inspection method, threshold, and repetitive interval. Determine this information from existing guidance information in the Compliance Document, or from the results of an individual damage tolerance evaluation performed in AC 25.571-1C. Then determine the feasibility of an inspection program to maintain continued airworthiness. If the inspection program is practical, incorporate the DTI into the individual airplane maintenance program. If the inspection is either impractical or impossible, incorporate a replacement time for the repair into the individual

airplane maintenance program. The three-stage approach discussed in Appendix 5 of this AC may be used, if appropriate.

APPENDIX 7. REPAIRS TO REMOVABLE STRUCTURAL COMPONENTS

This appendix provides guidance for DT data development and implementation for existing and new repairs to fatigue critical structure on removable structural components. In summary, the guidance covers:

- Methods of determining or assigning the age (in flight cycles or flight hours) to a removable structural component when its original life history is unknown.
- Guidance on tracking removable components that contain fatigue critical structure.
- Methods and schedules for developing and implementing DT data for repairs to removable components that contain fatigue critical structure.
- Implementation options for removable components that contain fatigue critical structure.

For determining the age of a component or tracking parts, methods other than those given below may be used if approved by the PMI as part of the Operator Implementation Plan.

a. Determining the Age of a Component. Determining an actual component age or assigning a conservative age will provide flexibility and reduce operator burden when implementing DT data for repairs to structural components. In some cases, the actual component age may be determined from records. If the actual age cannot be determined this way, the component age may be conservatively assigned using one of the following fleet leader concepts, depending upon the origin of the component:

(1) If part times are not available, but records indicate that no part changes have occurred, airplane flight cycles or flight hours can be used.

(2) If no records are available, and the parts could have been switched from one or more older airplanes under the same maintenance program, it should be assumed that the time on any part is equal to the oldest airplane in the program. If this is unknown, the time should be assumed equal to the same model airplane that is the oldest or has the most flight cycles or flight hours in the world fleet.

(3) A manufacturing date marked on a component may also be used to establish the component's age. This can be done by using the above reasoning and comparing it to airplanes in the affected fleet with the same or older manufacturing date.

If none of these options can be used to determine or assign a component age or total number of flight cycles or fight hours, a conservative implementation schedule can be applied in paragraph c of this AC, for the initial inspection, if required by the DT data.

b. Tracking. An effective, formal, control or tracking system should be established for removable structural components that are identified as fatigue critical structure or that contain fatigue critical structure. This will help ensure compliance with maintenance program requirements specific to repairs installed on an affected removable structural component.

Paragraph d. of this Appendix, provides options that could be used to alleviate some of the burdens associated with tracking all repairs to affected removable structural components.

c. Developing and Implementing DT Data:

(1) Existing Repairs – Components Installed prior to December 20, 2010. Accomplish the initial repair assessment of the affected component at the same time as the airplane level survey for the airplane on which the component is installed (paragraph b., above). Develop the DT data per the process given in Step 3 of Appendix 6 and incorporate the DTI into the maintenance program. Accomplish the first inspection on the affected component according to the following schedule:

(a) If the actual repair installation age or total number of flight cycles or flight hours is known, use that to accomplish the initial inspection of the component. Repeat the inspection at the intervals given for the repair.

(b) If the repair installation age or total number of flight cycles or flight hours is unknown, but the component age or total number of flight cycles or flight hours is known, or can be assigned conservatively, use the component age or total number of flight cycles or flight hours to accomplish the initial inspection of the component. Repeat the inspection at the intervals given for the repair.

(c) As an option, accomplish the initial inspection on the affected component at the next C-check (or equivalent interval) following the repair assessment. Repeat the inspection at the intervals given for the repair.

(2) Existing Repairs – Components Installed after December 20, 2010. For components installed after December 20, 2010, that have not previously had DTE performed and DTI implemented, develop and implement DT data as follows:

(a) If the time on the component (in flight cycles or flight hours) is known, or can be conservatively assigned, perform the following:

1 Survey the component,

2 Disposition the repair(s)

3 Implement the DTI in accordance with the schedule given for an airplane in Section 207b.(1) of this AC, using the component's age

4 Accomplish the first inspection using the actual repair age or total number of flight cycles or flight hours, if known. If the repair age is not known, use the component age. Repeat the inspection at the intervals given for the repair.

(b) If the time on the component (in flight cycles or flight hours) is unknown and cannot be assigned, accomplish the initial repair assessment of the affected component prior to installation.

1 Develop the DT data per the process given in Section 207b.(1) of this AC.

2 Incorporate the DTI into the maintenance program.

3 Accomplish the first inspection on the affected component at the next C-check (or equivalent interval) following the repair assessment.

4 Repeat the inspection at the intervals given for the repair.

(3) New Repairs. New repairs to fatigue critical structure on removable structural components installed beginning December 21, 2010, and thereafter, must have DTE performed and DTI implemented according to the process described in Appendix 5 of this AC. The initial and repetitive inspections are accomplished at the intervals given for the repair against the component.

d. Implementation Options to Help Reduce Tracking Burden. The following implementation techniques could be used to alleviate some of the burdens associated with tracking repairs to affected removable structural components. These techniques, if used, would need to be included in the Operator Implementation Plan(s) and may require additional FAA-approval and DAH input for DTI.

(1) Upgrading Existing Repairs. As an option, existing repairs may be removed and replaced to zero time the DTI requirements of the repair and establish an initial tracking point for the repair. Normally, this would be done at or before the survey for maximum benefit. The initial and repeat inspections for the upgraded repair would then be accomplished at the intervals given for the repair against the component.

A repair could also be upgraded to one with inspection requirements and methods already fulfilled by an operator's regular FAA-approved maintenance or inspection program (Section 302d. of this AC). That repair would be repetitively inspected at each routine inspection interval applicable to that repair. Specific tracking would not be required because that area of the airplane would already be normally inspected on each airplane in the fleet as part of the existing approved maintenance program. If the operator's program intervals were changed, the affect on requirements for specific tracking would have to be re-evaluated.

(2) Special Initial and/or Routine Inspections. As an option, existing repairs may have special initial inspections accomplished during the survey. This initial inspection would be used to establish an initial tracking point for the repair. Following this initial inspection, the DTI requirements (e.g., repetitive inspections) of the repair would be implemented.

In addition, special routine inspections could be defined for typical repairs that could be applied at a normal interval. In this case, an operator could check the affected components on each airplane for this type of a repair at the defined interval. If the repair were found, the special inspection would be applied to ensure its airworthiness until the next scheduled check. This would alleviate the need to specifically track affected components for every repair, especially typical ones.

The development of inspection processes, methods, applicability and intervals would most likely require the assistance of the DAH for the fatigue critical structure in question. In all circumstances, the data must be approved by the FAA Oversight Office.

APPENDIX 8. PROGRAM IMPLEMENTATION EXAMPLES

The following are provided to assist the operator in understanding how the program should be implemented. Two examples are given, one for airplanes below 75 percent DSG on December 18, 2009, and the other is for airplanes beyond DSG on December 18, 2009.

a. Airplane Below 75 percent DSG on December 18, 2009.

Consider the following:

(1) Airplane Total Cycles on December 18, 2010 – 55,000

(2) DSG = 75,000 Cycles, 75% DSG – 56,250 Cycles

(3) Time of last "D"-Check Equivalent – 53,000 Cycles

(4) 8 Year "D"- check Equivalent – 365 Days/Year, 4 cycles/day = 11,680 Cycles

The survey would be performed after the airplane reached 56,250 cycles and would be due before 64,680 cycles, but would be required before the airplane reached 75,000 cycles.

b. Airplane Beyond DSG on December 18, 2009.

Consider an airplane that has accumulated 80,000 cycles as of December 18, 2009, a DSG of 75,000 cycles. The airplane is currently on an 8-year D -check equivalent and the last D-check was performed in January 2009 at 78,540 cycles. The survey would need to be performed prior to the airplane accumulating 90,220 cycles or 6 years, whichever occurs first, based on the airplane utilization of 4 cycles/day, a 365-day year, and a maximum of 81,460 accumulated cycles as of December 20, 2010.